

PANEL AND MOUNTING MECHANISM

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit under 35 U.S.C. §119(e) of U.S. provisional application Serial No. 60/443,405, filed January 29, 2003.

BACKGROUND

[0002] The invention relates to a panel for use with a supporting grid in a suspended ceiling. The panel is of the type that conceals part or all of the grid when viewed from below. In particular, the invention is directed to an edge profile for use with the panel which allows the panel to be accessible from below. The edge profile also provides sufficient support for a panel, even when the panel is made from wood or some other material which has substantial weight or deforms easily when suspended in a ceiling.

[0003] Suspended ceilings having a grid network of metal beams of a generally inverted T-section are known. Ceiling panels are positioned within the grid openings formed by the grid network, and are supported in the openings by the grid. The size of the grid openings and the size of the panels may vary, in other words, irregularly shaped and sized openings and panels are used.

[0004] Ceiling panels are generally made of various substrates, including mineral fiber, fiberglass, wood, metal, plastic, or other compositions. In addition, panels are either of the type that expose the grid when the ceiling is viewed from below, or conceal the grid,

either fully or partially, when viewed from below. The invention described in this patent application relates to those panels that conceal the grid when viewed from below.

[0005] Panels that either totally or partially conceal the grid from below pose special problems, since the portion of the panel underlying the grid interferes with any simple installation, positioning, and removal of the panel. Panels that conceal the grid, however, are desirable for among other benefits, their appearance, as well as their ability to lock to the grid. Additionally, panels that cover the metal grid have a beneficial effect during a fire, as they serve to insulate the metal from the effects of the heat, particularly where the panels are of fire retardant material.

[0006] Since the panels that conceal generally have a lip below the grid as well as one above the grid, there is the potential for locking panels to the grid. This locking feature is especially useful during a fire or a seismic disturbance, as falling panels present a serious threat to the safety of the persons present below the ceiling. Thus, this locking feature is particularly useful where gatherings occur, such as in auditoriums or public areas.

Additionally, locked panels which give no visual indication as to their removal procedure provide a degree of security against unauthorized access to the space above the ceiling.

[0007] Notwithstanding the desirable features of panels that conceal the grid, their use has been limited because of problems with installation and removal. Generally the space above the grid must be used in installing or removing the panel, requiring such space to be available, thus reducing the usable room height. In some instances, specially designed grids must be used. In other applications, auxiliary clips or metal attachments to the grid are necessary. In other instances, the installer is required to position each panel visually from below, thus resulting in a slowdown in installation. Even without the necessity of

visual positioning during installations, the installation process of many of the prior art panels is relatively slow.

[0008] One prior art ceiling panel that attempts to overcome some of the problems described above is disclosed in U.S. Patent Number 6,230,463. The ceiling panel described conceals the grids in the suspended ceiling. The panel has integrally formed opposed active first and second edges with profiles cut therein which are different from one another, and opposed passive edges. An access kerf and a registration kerf positioned at different levels in the active edges, along with a registration step in one active edge, permit the panel to be inserted or removed by successive hinge actions. When installed, the panel is locked to the ceiling with no visual indications of how the panel can be removed. During the installation, the panel is self-centering and self-aligning.

[0009] While the particular configuration shown in the above-referenced patent has many advantages, several problems exist. As the profiles are cut into the edges, insufficient support may be provided for panels of sufficient weight, thereby allowing the panels to warp or cause an uneven appearance. Consequently, for ceiling made of wood planking and the like, the invention disclosed in the prior art patent may prove unacceptable. If the panels are not properly supported, the panels may sag or warp or the spacing of the panels may not be properly maintained, thereby adversely impacting the seamless appearance of the ceiling is lessened. In addition, the profiling of the edge, as taught in the referenced patent, requires a relatively complicated cutting tool to insure that all surfaces are properly maintained. Consequently, the wear and the maintenance of the

tooling can be costly, particularly when the panel is made of wood planking or other substantial material.

SUMMARY

[0010] The invention is directed to a suspended ceiling panel that has at least two edges that extend between a first major surface and a second major surface. Recesses are provided in the first major surface and extend from the first major surface toward the second major surface. The recesses have interior walls that are precisely located on the first major surface. Mounting members with locating sections are provided and cooperate with and engage the interior walls to precisely locate the mounting members. Mounting sections are provided on the mounting members to cooperate with ceiling grids to mount the ceiling panel to the ceiling grids.

[0011] In addition the invention is directed to a suspended ceiling panel system that has a grid system. Each grid has a support member with flanges extending from ends thereof. A ceiling panel is also provided and has edges extending between a first major surface and a second major surface. A locating member is provided on the first major surface. A mounting member, having a locating section, cooperates with and engages the locating member to precisely locate the mounting member relative to the panel and the grid, thereby allowing the ceiling panel to be accurately mounted to the grid.

[0012] The invention is also directed to a suspended ceiling panel system having a grid with a support member and flanges extending therefrom. The system further has a ceiling panel capable of being installed and positioned into the grid from below. The ceiling panel has a separate mounting member mounted thereto which cooperates with

the ceiling panel to form a grid receiving recess. The mounting member has a mounting section provided thereon, such that when the ceiling panel is positioned within the grid, the mounting section and the flange cooperate to accurately position the ceiling panel relative to the grid.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIGURE 1 is a perspective view showing portions of two ceiling panels positioned on a grid member of a ceiling grid system.

[0014] FIGURE 2 is a horizontal sectional view of the a ceiling system, similar to that shown in Figure 1, showing portions of a first and a second panel positioned on the grid member.

[0015] FIGURE 3 is a horizontal sectional view, similar to that of Figure 2, showing a panel positioned and centered between respective grid members.

[0016] FIGURE 4 is a partial top view of a hook member which attaches to a respective panel.

[0017] FIGURE 5 is a horizontal sectional view of the hook member shown in Figure 4.

[0018] FIGURE 6 is a perspective view showing a first alternate ceiling system with the panels secured to the hook members.

[0019] FIGURE 7 is a horizontal sectional view of a second alternate ceiling system, showing two alternate ceiling panels positioned on grid members.

[0020] FIGURE 8A through 8D are schematic horizontal sectional views showing the progressive steps in installing a panel in the ceiling.

[0021] FIGURE 9A through 9D are schematic horizontal sectional views showing the progressive steps in removing a panel from the ceiling.

DETAILED DESCRIPTION OF THE DRAWINGS

[0022] As best shown in Figures 1 through 3, the panel 20 of the invention is of the type that is installed in a grid ceiling and supported by metal grids 22 having an H profile. The grids 22 are suspended from a support member 23 of the type commonly used in the industry. The support members are suspended from a fixed ceiling in a conventional manner. The support members can have a U profile (as shown in Figure 6), L profile or any other type of configuration. The metal grids 22 can be attached to the support members 23 by means of clips 24 (Figures 6 and 7) or by screws 25 (Figure 2) or any other means used in the industry. The grids are generally used to form a rectangular opening, but can form square, trapezoidal, hexagonal, octagonal, or other regular or irregular shapes. Additionally, a panel may carry a decor or fanciful design on its lower face, or a sculptured surface that provides a three dimensional effect to the ceiling. In the embodiment shown, the panels are wood planking which provides a finished wood appearance to the ceiling, however, the panel may be made from various substrates, including but not limited to mineral fiber board, fiberglass, wood, metal, plastic or other compositions.

[0023] In the example embodiment shown in Figures 1-3, grid 22 has an H profile which has been rotated ninety degrees. The grid 22 has a top support 26, a bottom support 27 and a web 28 connecting the top support to the bottom support. As best seen in Figure 3, flanges 29 extend from either end of the bottom support 27 and cooperate with respective hook members 40, as will be more fully described below. Seismic clip receiving members 30 are positioned on either side of web 28 and extend in a direction which is

essentially parallel to the direction of the top support 26. The seismic clip receiving members 30 are configured to receive and retain seismic clips (not shown) therein.

[0024] Referring to Figures 1 through 3, the panel 20, when in position in the ceiling, has a flat top plane 31 and a flat bottom plane 32. The description of the panel in the following disclosure refers to the panel elements when the panel extends in a horizontal plane, as in a ceiling.

[0025] Referring to Figure 3, each panel 20 has opposed edges 33, 34 which extend between top plane 31 and bottom plane 32. A recess or cut out portion 35 extends from edge 33 in a direction toward edge 34. In addition recess 35 extends to top plane 31. A recess 36 extends from edge 34 in a direction toward edge 33. The recess 36 also extends to top plane 31 and is essentially a mirror image of recess 35. Each recess 35, 36 has a bottom surface 37, which extends essentially parallel to top plane 31, and an interior wall 38, which extends in a direction parallel to the respective edges 33, 34. When assembled, a gasket 39 is provided between adjacent panels 20. The gasket can be made of foam, rubber or any other known material that has the ability to conform to the space between the edges of the adjacent panels 20. However, the use of a gasket 39 is not always required or needed.

[0026] Hook members 40, as best shown in Figures 3 through 5, have an attachment section 41, a locating section 42 and a hook section 43. The attachment section 41 is a flat planar section which has mounting openings 44 extending therethrough. The mounting openings 44 are spaced periodically to provide the strength and stability requirements to properly secure a hook member 40 to a panel 20, as will be more fully described. The locating section 42 extends from the attachment section 41 at essentially

a ninety-degree angle therefrom. The hook section 43 extends from the locating section 42 in essentially the opposite direction from the locating section 42. In the embodiment shown, the hook members 40 are made from extruded aluminum, but other materials that have the appropriate strength characteristics can be used without departing from the scope of the invention.

[0027] The panels 20 and hook members 40 are generally shipped to the installation site separately, but can be assembled before shipping. In the field, the hook members 40, which are generally shipped in eight or ten foot lengths are cut to the length desired. The length of the hook member 40 should be equal to or slightly less than the length of the panel 20 to which it will be attached. Once cut, the hook member 40 is moved into engagement with the panel 20. As shown in Figure 3, the attachment section 41 cooperates and slides on the top plane 31. The hook member 40 is moved toward the center of the panel 20, until the locating section 42 makes contact with the interior wall 38 of the recess 35, 36. The movement of the hook member 40 continues until the locating section 42 is in contact with the interior wall 38. As the positioning and dimensions of the interior wall 38 are precisely controlled during the manufacture of the panel 20, the engagement of the locating section 42 and the interior wall 38 insures that the hook member 40 is properly positioned relative to the panel 20. With the hook member 40 properly positioned, screws 45 inserted through the mounting openings 44 and screwed into the panel 20 to maintain the hook member 40 in proper position. Other means of securing the hook member 40 to the panel 20, such as adhesive, can be used without departing from the scope of the invention.

[0028] As shown in Figure 3, when the hook member 40 is mounted on a respective panel 20, a grid receiving cavity 46 is formed. The grid receiving cavity 46 has a bottom surface which is comprised of the bottom surface 37 of the recess 35, 36, a side surface which is comprised of the interior wall 38 of the recess 35, 36 and the locating section 42, and an irregular top surface which is comprised of the hook section 43 of the hook member 40. The top surface of the respective cavity 46 extends toward the respective edge 33, 34, but is offset from the respective edge.

[0029] The use of hook members 40 and the positioning of the cavities 46 allow for panels 20 to be easily inserted into the grids 22 from below the plane of the grids 22, as will be more fully discussed. As the hook member 40 is a distinct and separate piece from the panel 20, the hook member 40 can be manufactured of a material that has the strength and rigidity requirements that allow the hook member 40 to maintain its shape over time in various environments having different temperature and humidity levels. By attaching the hook member 40 proximate the edge of the panel 20, the hook member 40 provides a back bracing to the panel 20, imparting to the panel 20 strength and rigidity characteristics which prevent or minimize the propensity of the panel 20 to sag or warp over time, which in turn maintains the proper spacing between panels 20. Thus, the use of hook members 40 maintains the integrity of the panels 20, thereby enhancing the appearance of the ceiling.

[0030] Referring to Figures 2 and 6, additional back bracing 47, 48 may be required when the panels are of sufficient size or weight that the hook members 40 can not adequately support the panel. The additional back bracing 47, 48 can be attached to the panels by any conventional means, i.e. screws, adhesive, etc. A safety wire 49 may be

provided which extends from the fixed ceiling to the bracing 47, 48. The safety wire generally has slack provided therein and is provided to prevent the free fall of the panel in instances where the panel may accidentally come loose from the grids. As is evident from the figures, the additional back bracing 47, 48 may extend in a direction parallel to the hook members 40 or perpendicular thereto depending on the configuration of the respective panels.

[0031] The positioning and cooperation of the cavities 46, the hook sections 43 of the hook members 40 and the flanges 29 and bottom supports 27 of the grid members 22 allow the panels 20 to be inserted and removed from the grid network from below the plane of the grid network. The positioning and cooperation also allows the panels 20 to be inserted into the grid network such that once properly installed, the finished ceiling has a seamless appearance.

[0032] Referring to Figures 8A through 8D, the installation process will be described in more detail. The panel 20 is brought into position toward the ceiling in an inclined position, as shown in Figure 8A, with a respective edge 34 uppermost. It is important to note that the orientation of the edge 34 as the uppermost edge is merely shown for convenience, and that the positioning of the edge 33 in the uppermost position is equally as beneficial. Arrow J denotes the angle and motion of edge 34 as it is being positioned. As the motion indicated by arrow J continues, the edge 34 of the insertion panel is received in the cavity 46 of an adjacent panel. With edge 34 received in cavity 46, the bottom plane 32 of the panel moves on top of the bottom surface 37 of the cavity 46. The movement can continue until the flange 29 abuts the locating section 42, as is shown in

Figure 8A. The cavity 46 must have sufficient dimensions to allow the angled insertion of the edge of an adjacent panel.

[0033] The panel 20 is then pivoted, as indicated by arrow K in Figure 8B, to bring the trailing edge 33 into proximate relationship to a respective grid 22 and respective cavity 46. In this position, the panel 20 approaches a parallel relationship to the support member 23, however the exact orientation of the panel 20 is not critical to the insertion. In order to accommodate the continued insertion of the panel 20, it is important that the movement indicated by arrow K position each respective hook section 43 of the panel above its respective flange 29.

[0034] Referring to Figure 8C, the panel is next moved in the direction of arrow L. This movement continues until the edges 33,34 do not overlap with edges of the adjacent panels, thereby allowing the panel 20 to be moved in the direction indicated by arrow M of Figure 8D and be properly aligned and oriented with the other panels of the ceiling.

[0035] As the panel is moved to the position shown in Figure 8C, the hook sections 43 of the hook members 40 are moved into alignment with the flanges 29 of the grids 22. Consequently, as the panels are moved into the position shown in Figure 8D, the hook sections 43 engage the flanges 29 and cause the flanges 29 to be seated therein. As the hook members 40 are precisely positioned on the panel 20, as was earlier described, the cooperation of the hook sections 43 with the flanges 29 precisely positions the panel 20 relative to the grid and thereby insures that the spacing between the panels will be accurately controlled, adding to the overall aesthetic appeal of the ceiling. If the panel 20 is misaligned when it is moved to the position shown in Figure 8D, the hook sections 43 will not properly seat on the flanges 29 and the installer will instantly know that the panel

20 has not been properly aligned. This provides the installer with immediate feedback and insures that the quality of the installation will be maintained.

[0036] While the manufacturing tolerances of the flanges 29 and hook sections 43 are adequately controlled, some play must be provided between the flanges 29 and the hook sections 43 to allow for installation. While this play is minimal, the use of the gaskets 39, as shown in Figure 3, in cooperation with the edges accommodates any slight spacing irregularities and provides a finished appearance to the ceiling.

[0037] To remove a respective panel 20 from the grids 22, essentially the reverse of the installation process is followed. As shown in Figure 9A, the panel 20 is first lifted upward in the direction indicated by arrow N. As this occurs the hook sections 43 are disengaged from the flanges 29. The hook sections 43 are maintained in a position above the plane of the flanges 29. The panel 20 is then moved in the direction of arrow O of Figure 9B, causing the edge 34 to be moved into the cavity 46. With the edge 34 positioned in the cavity 46, the respective hook section 43 of the trailing edge of the panel 20 is moved out of alignment with the flange 29. The trailing edge is then pivoted downward, as indicated by arrow P of Figure 9C, until the trailing edge is moved downward beyond the plane of the ceiling. The panel 20 is then completely removed from the ceiling by moving the ceiling in the direction of arrow Q shown in Figure 9D.

[0038] As the removal process requires various coordinated movement to easily remove the panel from the grid, the possibility of accidental or inadvertent removal is minimized. For example, if only one edge of the panel is moved upward, the hook section at the other edge maintains engagement with the flange, thereby preventing the panel from being moved in the direction indicated by arrow O. Consequently, the panel will not be

removed unless all of the steps recited above are followed. In addition seismic clips or the like can be incorporated into the ceiling to provide increased safety as required.

[0039] The insertion and removal process of the panels allows the panels to be inserted and removed as required with no damage to the panels or the grids. If a panel is damaged, it can easily be replaced by a comparable panel. The ability to install and remove the panels from below the plane of the ceiling is an advantageous feature of the ceiling.

[0040] Referring to Figure 7, an alternate embodiment is shown. In this embodiment, each panel has narrow recesses 50 which are offset from, and extend parallel to edges 33, 34. The recesses 50 are precisely positioned with respect to the edges and are configured to cooperate with the locating section 42 of the hook members 40. The hook members 40 are identical to those described in the other embodiments described herein. As shown in Figure 7, the hook members 40 are positioned on the panel 20 such that the locating sections 42 are seated in the recesses 50. As was previously described, the hook sections 42 cooperate with the flanges 29 to suspend the ceiling panels in a similar manner.

However, as the ceiling panels in this embodiment are spaced from each other a sufficient distance, the panels 20 do not present the same type of seamless appearance as previously described. Therefore, as the spacing between panels 20 is sufficient, the panels 20 do not require that recesses be provided which extend from the edges. Upon insertion and removal of the panels 20 from below, the panels can freely rotate a sufficient distance without contacting adjacent panels. Although the panels 20 are spaced further apart, the spacing of the panels must be precisely maintained to provide the visual appearance

desired. To that end, the hook sections 43 and flanges 29 cooperate in the same manner to insure that the precise spacing of the panels 20 is achieved.

[0041] The invention can be used on panels with shapes other than rectangular. Such shapes must have opposed edges with profiles and hook members as described above. Various other alternative materials, securing methods, profiles and configurations can be used without departing from the scope of the invention. Other changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only. It is therefore intended that the foregoing description be regarded as illustrative rather than limiting.